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Using Venture Capital to Improve Army Research and Development

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SUMMARY

The U.S. Army is having difficulty balancing its need for new technologies with the resources available to develop them. Since it is unlikely that the Army will devote substantially greater resources to its research and development (R&D), the Army must find better methods for developing the technologies needed to stage its revolution in military affairs (RMA) while keeping current equipment relevant and affordable. This issue paper introduces the idea that the Army should fund some of its technology development through a private venture capital organization. The concept exploits venture capital's efficiency in developing technology, its access to the growing commercial technology sector, its capacity to respond with agility to changing technology, and its ability to leverage additional resources throughout the development cycle.

Venture capital describes a number of investing schemes that have two common characteristics. First, venture capital is generally targeted at new companies that have a concept, a plausible market, and a business plan but lack the resources to develop and market the concept. The risks associated with such investments make other types of financing unavailable and allow the venture capitalist to demand large rewards: most often, an equity stake in the funded business. Second, venture capitalists usually provide more than just money. They actively help manage and promote the businesses they are backing.

AN ARMY VENTURE CAPITAL FUND

We propose that the Army set up a venture capital fund as a not-for-profit corporation that makes equity investments in early-stage companies developing tech-

nologies that are important to the Army but also have potential to find commercial markets in the longer term. The Army's venture capital fund should focus on investments in early-stage companies that are still in the technology or product development phase and have not yet gone public or been acquired. The fund should also be able to earn revenue through its equity investment activities, by dividend, interest, or the capital gains earned with the acquisition and subsequent sale of equity securities of investee companies. Such revenue would be retained in the corporation and reinvested as deemed appropriate by a board or the fund's management. Finally, the fund should be free to leverage capital from other investors through partnerships; contractual relationships with other funds, corporations, or government agencies; or by investing in other technology-related venture capital funds.

VENTURE CAPITAL EXPLOITS INNOVATION

Though relatively young in its current forms, venture capital has been very successful in developing and exploiting innovation. Many of the most inventive companies in the world, including Intel, DEC, Apple, Microsoft, Sun Microsystems, FedEx, Genentech, and Netscape, used venture capital as a key resource and exemplify its success. Studies have also verified a positive correlation between venture capital and innovation, noting for example the high rates of patenting activity for firms backed by venture capital¹ and the large R&D investments these firms make in comparison to other companies.²

The reasons for venture capital's success are its inherent incentives and an organizational structure that facilitates the development of innovative ideas. Young, small,

and growth-oriented companies typify the investee. Their potential products or services are new and intended to develop new markets or redefine older ones. The company founders are risk takers, motivated by their vision. The investors are experienced businessmen and businesswomen, risk takers as well, but they expect to be amply rewarded for taking those risks. They are adept at managing young companies and commit significant intellectual capital, business experience, and time to the companies they back in order to maximize the opportunities for success. Whether the Army could take advantage of the incentive and organizational structures that make venture capital an innovation engine is the primary issue of this paper, but evidence suggests that it could.

VENTURE CAPITAL IS EXPLOITED BY LARGE PRIVATE AND PUBLIC ORGANIZATIONS

Many large corporations, even those with substantial internal R&D capabilities, recognize how well venture capital exploits innovation and now use it to develop technologies for their businesses. In one example, Xerox Corporation put together a successful venture capital fund to turn Xerox-developed technologies, otherwise dormant, into marketable products. Microsoft has earned a reputation as an acquirer of new, venture-backed startups that can contribute to its key technologies, and Lucent Technologies has a \$100 million venture capital fund that it uses to invest in new technologies, despite its staff of 30,000 scientists. These examples are important when considering whether a venture capital model will work for the Army. They suggest that large organizations, even those with organic R&D capabilities, have found venture capital to be an efficient use of limited R&D resources.

Beyond these private sector examples, the use of venture capital is also spreading to the public sector. At the federal level, the example closest to what we envision for the Army is the Central Intelligence Agency's (CIA) In-Q-Tel enterprise.³ The CIA established In-Q-Tel about a year ago to solve some of its most difficult information technology problems, and venture capital is one of the tools In-Q-Tel uses to address the CIA's needs. Though in existence for only a short time, In-Q-Tel appears to have made a very promising start. In addition, a number of state governments have set up successful venture capital funds for a variety of reasons, with financial return on investment (ROI) a secondary motive. With these funds the larger interest is in the socioeconomic advantages they bring to the state, such as job growth, expansion of light industry, and the development of companies that correct perceived problems (e.g., environmental).

ARMY VENTURE CAPITAL CAN BETTER ACCESS COMMERCIAL TECHNOLOGY

By using a venture capital model for some of its development needs, the Army could address one of its serious

R&D shortcomings: its limited access to the commercial technology development sector. Spurred by competitive forces and a population that eagerly accepts new technologies and the productivity gains that they garner, R&D spending by the U.S. commercial sector has quadrupled in three decades and continues to grow at more than 4.5 percent per year (see Figure 1). Contrary to popular belief, commercial R&D spending is not just committed at the product development stage. Private companies have outspent the federal government in applied research for a number of years now and are spending a large and growing percentage of the country's basic research dollars. What this means for the Army is that a growing portion of the technical innovation occurring in the country is happening in the commercial sector, thus making Army access to that sector more important than ever.

The Army leadership, recognizing the need to tap the commercial technology sector, has emphasized its desire to increase collaboration with commercial technology developers. Unfortunately, the development of collaborative ties between the Army's R&D community and commercial technology developers is difficult given the Army's traditional contracting methods. Army contracting officers, often lacking the training, resources, and authority to conduct market research, tend to rely on a traditional contractor base to meet the government's needs. On the other hand, commercially oriented companies weigh the small size of the Army market against the burdens associated with the government's ponderous procurement rules, inflexible oversight requirements, and concerns about intellectual property. On balance, the benefits of collaboration generally fail to overcome the burdens.

In response to the problems associated with traditional government contracting, reform efforts have resulted in new R&D contracting tools tailored to provide access to the commercial sector. These include the cooperative research and development agreement (CRADA), the coop-

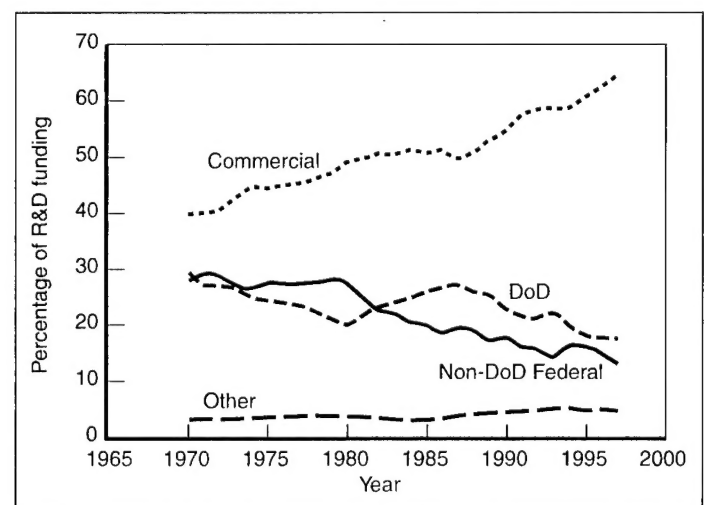


Figure 1—Percentage of U.S. Research and Development Spending by Sector

erative agreement (CA), and the "other transaction" (OT). While these new contracting tools address many of the concerns noted above, the Army's success with them has been lackluster, being more anecdotal than systemic.⁴ Two major problems have hindered this reform effort. First, the current Army acquisition culture neither understands nor sympathizes with the business needs and methods of the commercial world. Culture, economics, and history continue to make it difficult for the Army to work outside its established contractor base. Second, much of the commercial technology sector remains skeptical of the government's commitment to reform, does not need the government's R&D business, and distrusts government contracting in general. Overcoming these issues requires many years of workforce retraining and relationship building with the commercial sector. This is time the Army can ill afford.

A venture capital organization, funded and chartered by the Army but run outside of the government by a venture capital professional, could circumvent some of the Army's problems in trying to collaborate with the commercial sector. This kind of setup, similar to the CIA's In-Q-Tel, provides a means of solving the problems that undermine current R&D acquisition reform efforts. In this scheme, the Army venture capitalist acts as a middleman who understands the needs of the business and technology communities and who shapes agreements that solve Army technology problems while meeting those needs. Since the venture capital organization would be outside of the Army, it should be better able to gain the trust of commercial clients and also act more quickly and flexibly than could the Army's current contracting organizations.

VENTURE CAPITAL CAN LEVERAGE NON-ARMY RESOURCES

Another important reason for the Army to develop a venture capital fund is that it can be used to leverage non-Army resources. Today most Army research is conducted with Army resources. Although some of the newer contracting tools allow cost sharing on research projects, there are practical and legal limits on the amount of cost sharing available. In contrast, venture capitalists and the entrepreneurs they support freely seek funding from any number of sources. Assuming the Army's fund invests in technologies that also have considerable commercial potential, it will most likely be able to attract significant co-investment. The advantages are obvious. Leveraging allows the Army to stretch its own R&D resources so that it can accelerate the development of key technologies while continuing to invest in a diverse range of new ideas.

VENTURE CAPITAL PROVIDES A RETURN ON INVESTMENT

Commercial venture capital's reason for being is to earn a ROI. As mentioned earlier, venture capitalists

expect large returns in compensation for the risks they place on their investments. Identifying an average return across the venture capital industry has proved difficult, and estimates vary considerably. Despite this, the success of the venture capital industry can be clearly inferred from the exponential growth in investment. As Figure 2 shows, over the last 20 years the dollars invested in venture capital funds have grown by an order of magnitude.⁵

Most of the technologies appropriate for investment by an Army venture capital fund will be those that fulfill a near-term Army requirement but have longer-term commercial potential. By using a venture capital model to make the initial investments in new technologies, the Army will be able to earn a ROI as the commercial market for these technologies grows. This return can then be used to further strengthen Army R&D through reinvestment by the Army's venture capitalist.

VENTURE CAPITAL HELPS GIVE RISE TO ENTIRE INDUSTRIES

Finally, an Army venture capital fund could play a part in reinvigorating America's defense industry. There is a general rule of thumb that radically new technologies are usually developed, marketed, and matured by new companies. With some exceptions, making bold technological and product line shifts is difficult for established companies, which usually prefer to evolve along the established lines that have been successful for them in the past. In its short history, venture capital has thus become the source of startup money for many emerging industries. In the military, many of the transforming technologies also spawned new industries. Repeating rifles, radio, aircraft, and, today, the integrated circuit come readily to mind. Though these products eventually grew very large commercial markets, the first customer was the military, so to a great extent the military was able to guide the development of these industries and technologies. With most R&D today occurring in the commercial sector and with the change in markets, many of tomorrow's trans-

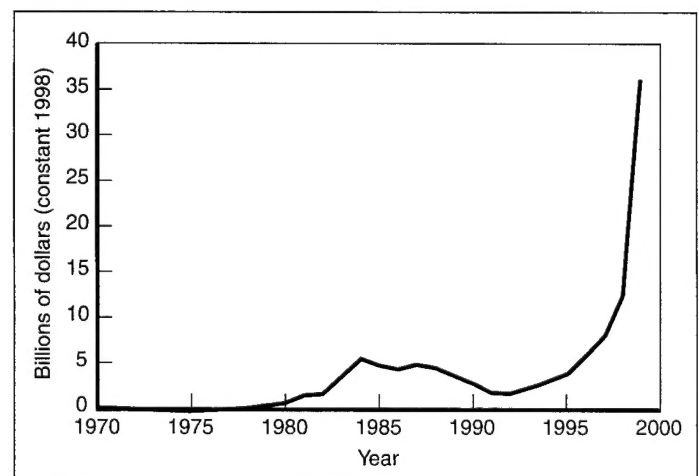


Figure 2—Total Venture Capital Funds Invested

forming technologies—e.g. biotechnology and networking—are being developed with little input from the military. By creating its own venture capital fund, the Army can regain some of its access and influence in emerging industries.

POSSIBLE IMPLEMENTATION STRATEGY FOR AN ARMY VENTURE CAPITAL FUND

We recommend that the Army's venture capital fund, tentatively named the Army Innovation Investment Corporation (AIIC), be managed by a board of directors whose members are private citizens selected by the Secretary of the Army for staggered 2- to 3-year terms. An estimated \$2 million would be required to set up the AIIC. We also suggest that approximately \$30 million be budgeted to the AIIC every year in its first five years of operation. Beyond the initial five years, the AIIC, if successful, should be self-sustaining with an investment portfolio averaging \$150 million.

The AIIC could be formed under two alternative scenarios. In the first, the private citizens that compose the board would incorporate a not-for-profit corporation under the jurisdiction of some state. Alternatively, Congress could incorporate the AIIC under a federal charter, much as it does with federal government corporations. The existing authority of 10 U.S.C. Section 2371, the "other transactions" statute, can easily accommodate the required financial relationship.

Having the right mix of the right people will be the most important factor in the formation and subsequent maintenance of AIIC. The staff must contain a team of personnel with business, technology, and government expertise. This eclectic group must then be integrated by a strong leader who not only understands the complexity of technologically oriented business deals, but who can also navigate the political and bureaucratic terrain inherent to an organization of this type. In the case of In-Q-Tel this requirement has been satisfied by mixing very bright young people, recently graduated with advanced degrees in business and science/engineering, with personnel experienced in venture capital, business, and government.

An Army advisory committee composed of personnel from the Army Materiel Command (AMC), the Office of the Assistant Secretary of the Army for Acquisition, Logistics, and Technology (ASA(ALT)), and the Training and Doctrine Command (TRADOC) would form the interface between the Army and the AIIC. The committee would communicate the Army's operational requirements and technical needs to the AIIC, which, however, would make all business decisions on investments. The advisory committee would also be responsible for the transfer of technical information from the AIIC back to the Army.

CONCLUSION

Over the last few decades, venture capital has emerged as a financial engine for the new technologies and industries that are changing the world. The structure of the industry encourages innovation and gives entrepreneurs the tools they need to develop and market their innovative ideas. Since the Army is increasingly dependent on advanced commercial technologies, it seems natural for it to consider adopting a venture capital model for some of its technology development. Such an approach has been successful for other large, technically oriented organizations and has also proved successful with other government entities. In conclusion, therefore, the use of a venture capital model for development of relevant advanced technologies could significantly help the Army achieve the acquisition reform goal of affordably acquiring the leading-edge technologies it needs.

ENDNOTES

¹Samuel Kortum and Josh Lerner, "Does Venture Capital Spur Innovation," Working Paper 6846, Cambridge, MA: National Bureau of Economic Research, December 1998.

²PriceWaterhouseCoopers, *Fifth Annual Economic Impact of Venture Capital Study*, November 1998.

³Many of the concepts presented in this issue paper are borrowed from the CIA's establishment and development of In-Q-Tel.

⁴For a more detailed discussion, see Kenneth Horn, Elliot P. Axelband, Ike Yi Chang, Paul S. Steinberg, Carolyn Wong, and Howell Yee, *Performing Collaborative Research with Nontraditional Military Suppliers*, Santa Monica, CA: RAND, MR-830-A, 1997.

⁵Sources for Figure 2: for data prior to 1999, Paul A. Gompers and Josh Lerner, *What Drives Venture Capital Fundraising*, Cambridge, MA: National Bureau of Economic Research, January 1999; 1999 data are based on extrapolation of first half-year results from VentureOne Corporation, Industry Data Web site.

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